

EarthScope Student Geochronology Research and Training Program Laboratory Overview

University of Utah Petrochronology/Metals Laboratory - 01/31/17

Lab Description

The Petrochronology/Metals Lab at the University of Utah is a well-equipped, but small lab that caters to visitors who seek full involvement during their analyses. Visitors are encouraged to learn as much as possible about the instrument setup, tuning, analysis, and data reduction. This is all done under the supervision of the lab PI, Diego Fernandez, and staff, Michael Stearns.

The lab has several instruments that can be used one at a time or can be simultaneously for split-stream analysis. We specialize in laser ablation analysis of U/Th-Pb isotopes and trace elements in zircon, titanite, and monazite:

- Photon Machines 193 nm excimer laser with Helex Cell™
- Thermo Neptune – Hf, Nd or Sr isotopes
- Thermo NeptunPlus – U/Th-Pb dating
- Agilent 7500ce – major and trace elements, or reconnaissance U/Th-Pb dating
- FEI NovaNano scanning electron microscope equipped with SE, BSE, and CL detectors
- mineral separation lab – rock crusher, disc mill, heavy liquid lab, Frantz mag. separator

Timeframe and training

If bringing prepared samples, a typical visit involves at least one day of training and one additional day for analysis. This first day is typically less productive (~2–4 samples completed) than the following days. Most visitors budget for ~6 samples per day of analytical time. The typical analytical day is from 8 AM–8 PM. A minimum of 5 samples is required. If visitors require mineral separation, sample imaging, or more than one analysis type, additional time must be planned. Mineral separation requires at least 3 days and is most efficient to combine 5–10 samples per step. Imaging requires ~1–2 hr of instrument time per sample and ~2 weeks of lead time for planning. Please contact to discuss if mineral separation or imaging is required.

Lab visitors are encouraged to complete mineral separation, sample mounting/polishing, and the necessary imaging prior to their planned visit. Depending on the sample type, the visitor may bring polished, uncovered standard-size thin sections (27 x 46 mm) or 25 mm diameter polished epoxy mounts. Ideally, each 25-mm mount has ≥ 6.5 mm of free space to mount matrix-matched standards (we drill a 6.5 mm hole and insert our standard mount). The laser tray hold four thin sections and three 25 mm mounts at one time.

Analytical procedures that a student will be involved in during their visit:

- instrument setup
- laser spot placement and standardization protocols
 - using SEM images to place laser spots
 - laser operation
 - which standards to use
- mass spectrometer operation
 - instrument tuning
 - starting and stopping analyses

- exporting data
- U/Th-Pb data reduction, reporting, and interpretation
 - Data selection and standardization/corrections with Iolite
 - Uncertainty treatments for LA-ICP-MS data
 - U/Th-Pb data interpretation with Isoplot and/or Matlab

Analytical cost

Training and data reduction help are included in these costs. Students should plan on ~40–50 analyses per petrologic sample and ~100 analyses per detrital sample.

- laser ablation U/Th-Pb (Neptune Plus): \$8/analysis
- laser ablation split stream (U/Th-Pb + TE; Neptune Plus + Agilent): \$12/analysis
- laser ablation split stream (U/Th-Pb + Hf or Nd isotopes; Neptune Plus + Neptune): \$16/analysis
- laser ablation trace element analysis: \$100/hour
- mineral separation and sample mounting/polishing: \$100/sample
- sampling mounting/polishing alone: \$25/mount
- SEM imaging: \$50/hour

Scheduling/lead times

Typical lead times are 1–2 months for scheduling work and coordinating with other types of analyses. Lab reservations can sometimes be rushed (~2-week lead time) in extenuating circumstances.

Lab staff

The following lab staff available for training and analyses. Please contact Michael Stearns if you are interested in LA(SS)-ICP-MS analyses.

- Michael Stearns michael.stearns@utah.edu - petrochronology specialist
- Diego Fernandez diego.fernandez@utah.edu - lab PI and tracer specialist